Apprenticeship and Industry Training

Elevator Constructor

Curriculum Guide

097 (2022)

Alberta

Apprenticeship and Industry Training

ALBERTA ADVANCED EDUCATION

Elevator Constructor: apprenticeship education program curriculum guide

ISBN 978-1-4601-5193-8

Elevator Constructor
Table of Contents

CURRICULUM GUIDE

Apprenticeship

Apprenticeship is post-secondary education with a difference. Apprenticeship begins with finding a sponsor. Sponsors guide apprentices, and support on-the-job learning through provision of mentorship. Approximately 80 per cent of an apprentice's time is spent on the job under the supervision of a certified journeyperson or qualified tradesperson. The other 20 per cent involves technical training provided at, or through, a post-secondary institution (PSI) – usually a college or technical institute.

To receive their post-secondary credential, apprentices must learn theory and skills, and they must pass examinations. Criteria for the program—including the content and delivery of technical training—are developed and updated by the Registrar.

The graduate of the Elevator Constructor apprenticeship program is an individual who will be able to:

- read and interpret prints to determine the layout of cylinders, electrical connections and other system components
- do preparatory construction work including steel work, wiring and piping
- install doors and frames, guide rails, counterweights, and elevator, escalator and walkway chassis
- connect car frames to counterweights with cables and assemble elevator cars
- wire electronic control system equipment
- test and adjust equipment
- trouble-shoot when mechanical or electrical systems fail and make the necessary repairs
- carry out preventative maintenance programs to ensure public safety
- perform assigned tasks in accordance with quality and production standards required by industry.

Apprenticeship and Industry Training System

Alberta's apprenticeship programs are supported by industry stakeholders that ensures a highly skilled, internationally competitive workforce in the province. The Registrar establishes the educational standards and provides direction to the system supported by industry and the PSI's. The Ministry of Advanced Education provides the legislative framework and administrative support for the apprenticeship and industry training system.

Special thanks are offered to the following industry members who contributed to the development of the standard:

Mr. R. Logee..... Calgary
Mr. C. Koczula..... Calgary
Ms. S. MacArthur ..... Edmonton
Mr. C. Austrom ..... Edmonton
Mr. A. Mroczek ..... Edmonton
Mr. C. Mercer ..... Calgary
Mr. B. Halfyard ..... Edmonton
Mr. J. Mitchell ..... Edmonton
Mr. K. James ..... Calgary

Alberta Government

Alberta Advanced Education works with industry, sponsor and employee organizations and technical training providers to:

- facilitate industry's development and maintenance of training and certification standards
- provide registration and counselling services to apprentices and sponsors
- coordinate technical training in collaboration with training providers
- certify apprentices and others who meet industry standards

Apprenticeship Safety

Safe working procedures and conditions, incident/injury prevention, and the preservation of health are of primary importance in apprenticeship programs in Alberta. These responsibilities are shared and require the joint efforts of government, sponsors, employees, apprentices and the public. Therefore, it is imperative that all parties are aware of circumstances that may lead to injury or harm.

Safe learning experiences and healthy environments can be created by controlling the variables and behaviours that may contribute to or cause an incident or injury. By practicing a safe and healthy attitude, everyone can enjoy the benefit of an incident and injury free environment.

Occupational Health and Safety

Persons engaged in, or supporting an individual in an experiential learning environment are often exposed to more worksite hazards than in other forms of traditional post-secondary education and therefore should be familiar with and apply the Occupational Health and Safety Act, Regulations and Code when dealing with personal safety and the special safety rules that apply to all daily tasks.

Occupational Health and Safety-OHS (a division of Alberta Labour and Immigration) conducts periodic inspections of workplaces to ensure that safety regulations for industry are being observed.

Additional information is available at www.alberta.ca/occupational-health-safety.aspx

Technical Training

Apprenticeship technical training is delivered by the technical institutes and colleges in the public post-secondary system Apprenticeship technical training is delivered by the PSI's throughout Alberta. The PSI's are committed to delivering the technical training component of Alberta apprenticeship programs in a safe, efficient and effective manner. All PSI's place a strong emphasis on safety that complements safe workplace practices towards the development of a culture of safety for all professions.

The PSI's work with industry and Alberta Advanced Education to enhance access and responsiveness to industry needs through the delivery of the technical training component of apprenticeship programs across the province. They develop curriculum from the curriculum guides established by the Registrar in consultation with the PSI's and industry and provide the technical training to apprentices.

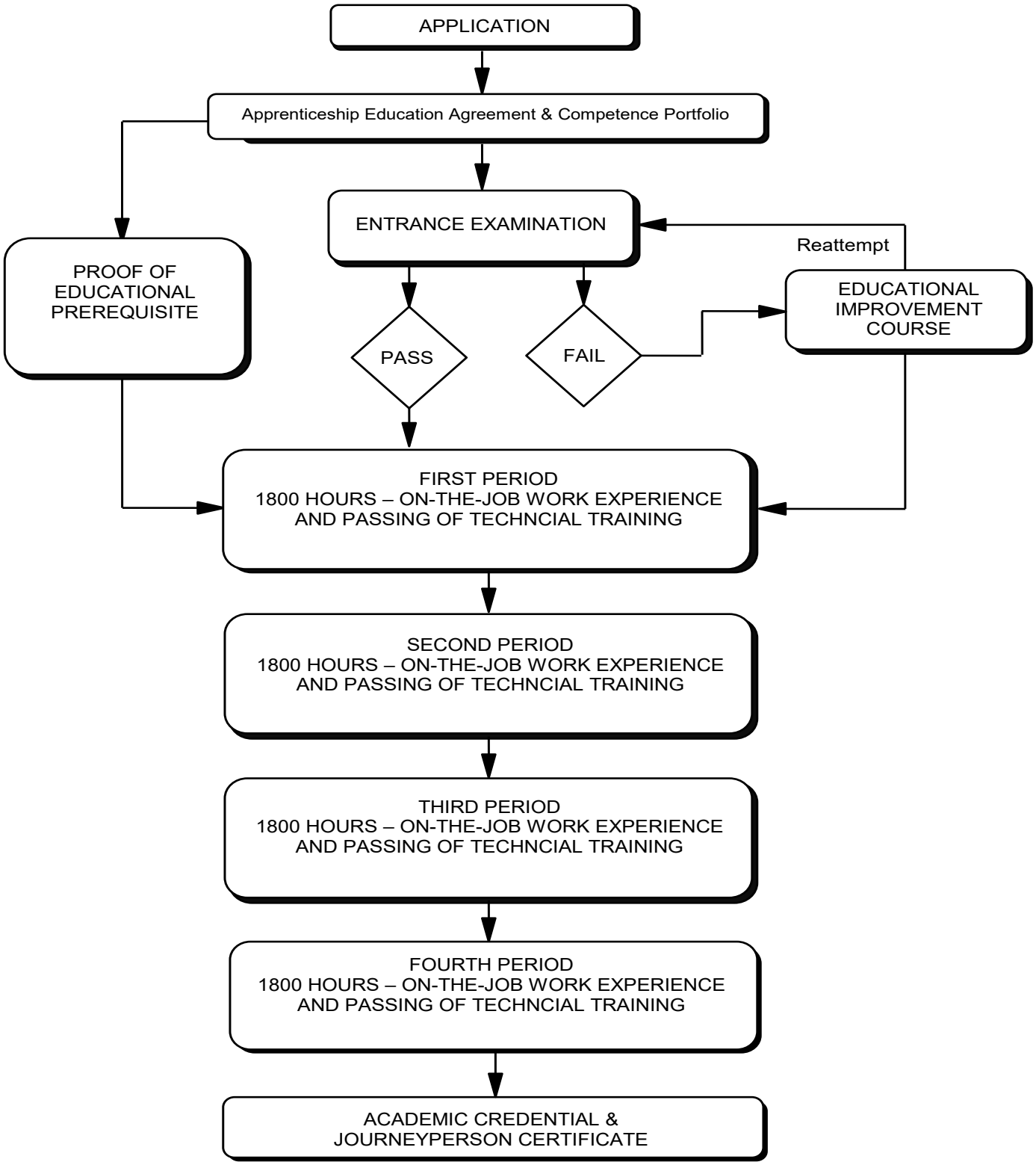
Procedures for Recommending Revisions to the Curriculum Guide

Any concerned individual or group in the province of Alberta may make recommendations for change by writing to:

Registrar of Apprenticeship Programs
c/o Apprenticeship Delivery and Industry Support Services
Apprenticeship Delivery and Industry Support
Advanced Education
19th floor, Commerce Place
10155 102 Street NW
Edmonton AB T5J 4L5

It is requested that recommendations for change refer to specific areas and state references used.

Apprenticeship Route toward Academic Credential



Elevator Constructor Training Profile
First Period
200 Hours

SECTION ONE

ELEVATOR SAFETY — **10%**

A	B	C
Safety Legislation, Regulation and Industry Policy in the Trades — 25%	Climbing, Lifting, Rigging and Hoisting — 25%	Hazardous Materials and Fire Protection — 20%

D	E
Apprenticeship Training Program — 5%	Tools, Oxy-Fuel and Equipment Safety and Babbitting — 25%

SECTION TWO

DRAWINGS, SPECIFICATIONS AND CODES — **10%**

A	B	C
Mechanical Drawings — 50%	Mathematics — 25%	Canadian Standards Association Codes (CSA) — 25%

SECTION THREE

TRACTION ELEVATORS — **35%**

A	B	C
Site Planning — 7%	Hoistway Compliance — 7%	False Cars and Guide Rails — 7%

D	E	F
Machine Room Equipment and Wiring — 15%	Pit Structures — 7%	Elevator Mechanical Systems — 7%

G	H	I
Hoistway Entrance Systems — 7%	Hoistway Wiring Systems — 7%	Car Cab Systems — 7%

J	K	L
Car Door Systems — 7%	Machine Roomless Elevators — 15%	Inspection of Elevating Devices and Commissioning — 7%

SECTION FOUR

ELEVATOR HYDRAULIC SYSTEMS — **25%**

A	B	C
Hydraulic Systems — 30%	Hydraulic Jacking Systems — 20%	Maintenance of Hydraulics — 10%

D	E
Hydraulic System Adjustment — 30%	Work Platforms — 10%

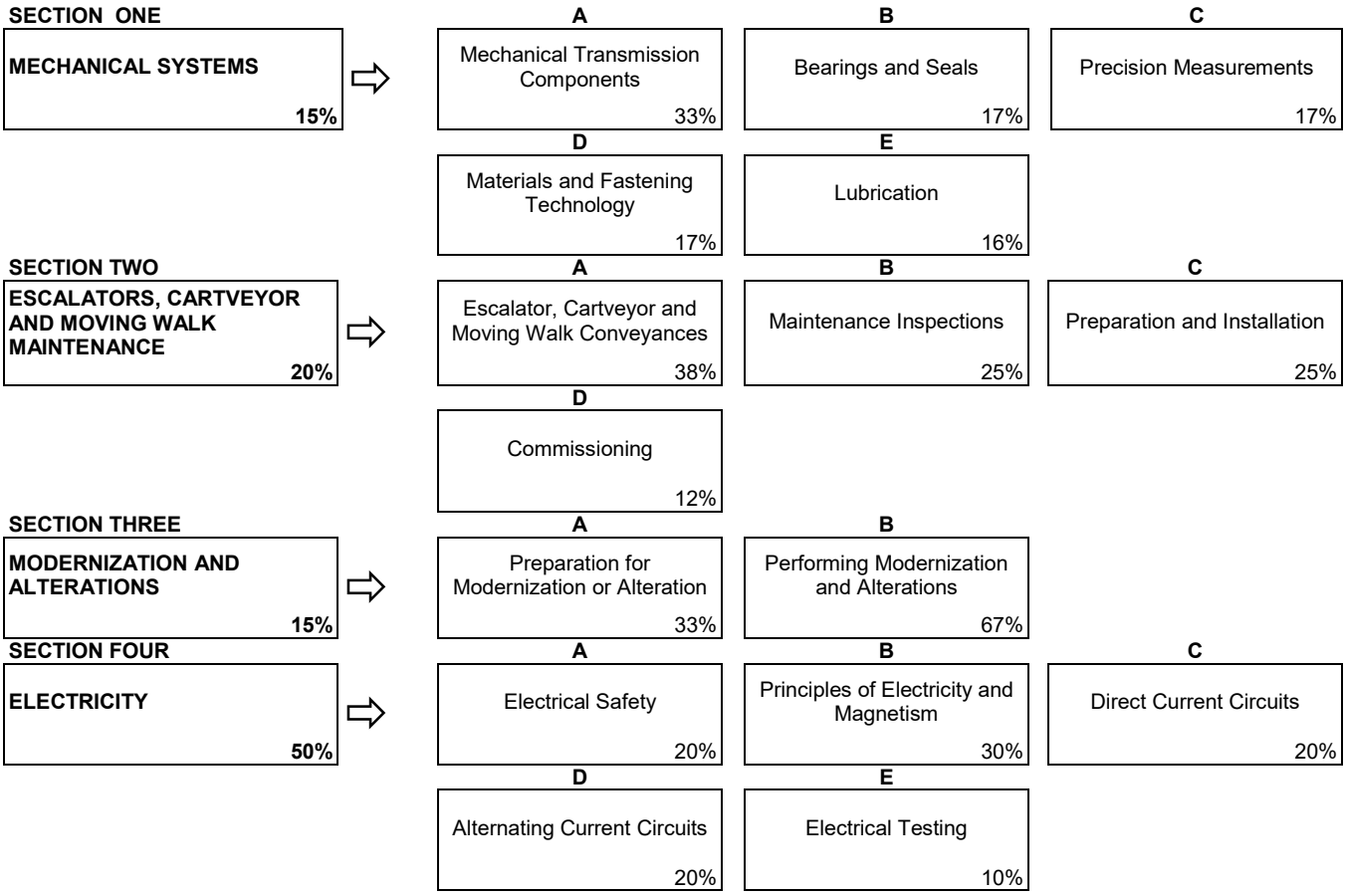
SECTION FIVE

HYDRAULIC ELEVATOR INSTALLATION — **20%**

A	B	C
Hydraulic Elevators — 38%	Hydraulic Distribution Systems — 25%	Hydraulic Control Systems — 25%

D
Hydraulic Field Inspections, Tests and Data Reports — 12%

Elevator Constructor Training Profile
Second Period
200 Hours



Elevator Constructor Training Profile
Third Period
200 Hours

SECTION ONE

ELECTRICAL SYSTEMS — **20%**

A	B	C
Electrical Control Systems 25%	Transformers 13%	Distribution and Control Devices 13%
D	**E**	**F**
Control Systems 25%	Electrical Diagrams 12%	Electrical Conductors 12%

SECTION TWO

GENERATORS AND MOTORS CONTROL SYSTEMS — **30%**

A	B	C
Generators 17%	Electric Motors 25%	DC Motor Control Systems 25%
D		
AC Motor Control Systems 33%		

SECTION THREE

ELECTRONICS — **20%**

A	B	C
Solid State Electronic Components 13%	Diodes 13%	Transistors 12%
D	**E**	**F**
Thyristors 12%	Digital and Analog Integrated Circuits 12%	Solid State Power 13%
G	**H**	
Solid State Electronics 13%	Programmable Logic Control Systems 12%	

SECTION FOUR

CIRCUIT TRACING AND TESTING — **30%**

A	B	C
Circuit Tracing 67%	Diagnostic Test Equipment 16%	Troubleshooting Procedures 17%

Elevator Constructor Training Profile
Fourth Period
200 Hours

SECTION ONE

SPECIAL APPLICATION LIFTING DEVICES AND GOVERNANCE **20%**

A	B	C
Inclined Travel Elevators 12%	Lifts for Persons with Physical Disabilities (LPPD) 33%	Silent Butlers 13%
D	**E**	**F**
Material Lifts 12%	Manlifts 12%	Construction Hoists 13%
G		
Workplace Coaching Skills 5%		

SECTION TWO

PREVENTIVE MAINTENANCE **20%**

A	B	C
Public Safety 13%	Site Visits 25%	Lock-Out-Tag-Out and Reinstatement Procedures 25%
D	**E**	
Remote Monitoring 25%	Log Books 12%	

SECTION THREE

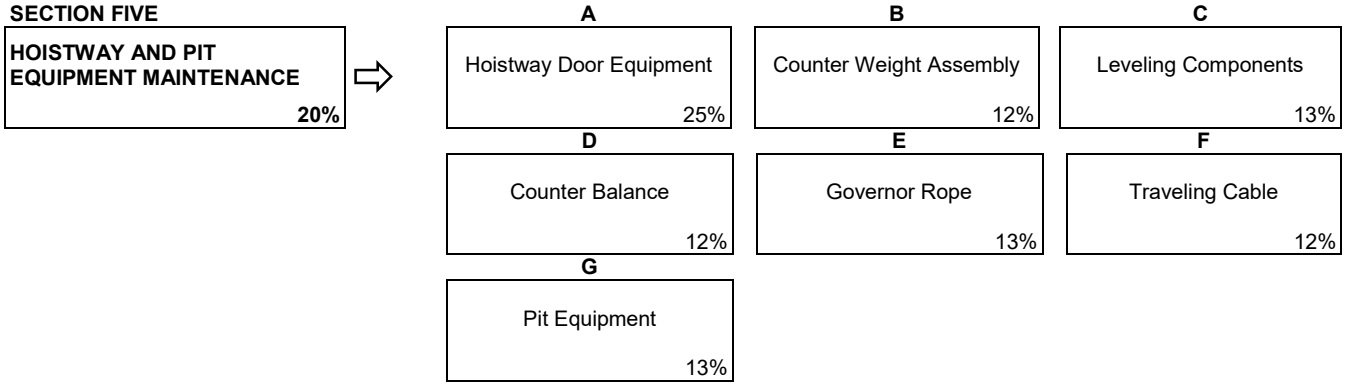
ELEVATOR MAINTENANCE ROOM EQUIPMENT **25%**

A	B	C
Machine Room Safety 10%	Motors and Generators 10%	Drive Machines 10%
D	**E**	**F**
Sheaves and Drums 10%	Machine Brakes 10%	Elevator Safety Devices 10%
G	**H**	**I**
Control Equipment 10%	Suspension Means 20%	Hydraulic System Devices 10%

SECTION FOUR

ELEVATOR CAR EQUIPMENT MAINTENANCE **15%**

A	B	C
Car Doors and Gates 17%	Elevator Enclosures 17%	Car Tops 17%
D	**E**	
Car Bottoms 16%	Car Safety Components 33%	



FIRST PERIOD TECHNICAL TRAINING
ELEVATOR CONSTRUCTOR TRADE
CURRICULUM GUIDE

UPON SUCCESSFUL COMPLETION OF THIS PROGRAM THE APPRENTICE SHOULD BE ABLE TO PERFORM THE FOLLOWING OUTCOMES AND OBJECTIVES.

NOTE: The safety and precautionary methods and procedures are to be reinforced throughout all of the training, when, and as, the subject matter is being practiced or demonstrated.

SECTION ONE:.....ELEVATOR SAFETY 10%

A. Safety Legislation, Regulation & Industry Policy in the Trades 25%

Outcome: ***Apply legislation, regulations and practices intended ensuring safe work in this trade.***

1. Demonstrate the application of the Occupational Health and Safety Act, Regulation and Code.
2. Describe the sponsor's and employee's role with Occupational Health and Safety (OH&S) regulations, Worksite Hazardous Materials Information Systems (WHMIS), fire regulations, Workers Compensation Board regulations and related advisory bodies and agencies.
3. Describe industry practices for hazard assessment and control procedures.
4. Describe the responsibilities of worker and sponsors to apply emergency procedures.
5. Describe tradesperson attitudes with respect to housekeeping, personal protective equipment and emergency procedures.
6. Describe the roles and responsibilities of sposnors and employees with the selection and use of personal protective equipment (PPE).
7. Maintain required PPE for tasks.
8. Use required PPE for tasks.

B. Climbing, Lifting, Rigging and Hoisting 25%

Outcome: ***Use industry standard practices for climbing, lifting, rigging and hoisting in this trade.***

1. Describe manual lifting procedures.
2. Describe rigging hardware and associated safety factors.
3. Select equipment for rigging loads.
4. Describe hoisting and load moving procedures.
5. Maintain personal protective equipment (PPE) for climbing, lifting and load moving equipment.
6. Use PPE for climbing, lifting and load moving equipment.

C. Hazardous Materials & Fire Protection 20%

Outcome: ***Apply industry standard practices for hazardous materials and fire protection in this trade.***

1. Describe roles, responsibilities, features and practices related to the Workplace Hazardous Materials Information System (WHMIS) program.
2. Describe three key elements of WHMIS.
3. Describe handling, storing and transporting procedures for hazardous material.
4. Describe venting procedures when working with hazardous materials.

5. Describe hazards, classes, procedures and equipment related to fire protection.

D. Apprenticeship Training Program 5%

Outcome: Manage an apprenticeship to earn journeyperson certification.

1. Describe the apprentice education agreement responsibilities of the apprentice, sponsor and Alberta Apprenticeship and Industry Training.
2. Describe the purpose of the competency portfolio.
3. Describe the procedure for changing sponsors during an active apprenticeship.
4. Describe the purpose of the curriculum guide.
5. Describe the procedure for advancing through apprenticeship.
6. Describe advancement opportunities in this trade.

E. Tools, Oxy-Fuel and Equipment Safety and Babbitting 25%

Outcome: Use tools and equipment.

1. Describe type and function of trade specific tools and equipment.
2. Describe tools and equipment maintenance.
3. Describe heating and cutting processes.
4. Describe operating principles of oxy-fuel equipment.
5. Describe oxy-fuel equipment maintenance.
6. Describe operating principles of babbitt.
7. Describe the hazards when heating babbitt.
8. Perform oxy-fuel heating and cutting.
9. Describe babbitting tools and equipment.
10. Use tools and equipment.

SECTION TWO: .....DRAWINGS, SPECIFICATIONS AND CODES 10%

A. Mechanical Drawings 50%

Outcome: Interpret drawings and specifications.

1. Describe types of drawings.
2. Describe drawing symbols.
3. Describe characteristics of materials, including strength and heat transfer methods.
4. Interpret dimensions of a drawing.
5. Interpret technical terms and abbreviations.
6. Interpret multiple views and elevations.

B. Mathematics 25%

Outcome: Perform trade related calculations.

1. Ratio and proportion.
2. Inclined planes.

3. Formulas.
4. Solve trade related problems.

C. Canadian Standards Association Codes (CSA) 25%

Outcome: Apply CSA/ASME codes.

1. Describe the purpose of code and standards.
2. Describe the structure of CSA policies.
3. Categorize trade specific codes.
4. Interpret codes and regulations regarding maintenance, procedures, and examinations and testing.
5. Apply specific codes.

SECTION THREE: ..... TRACTION ELEVATORS..... 35%

A. Site Planning 7%

Outcome: Coordinate site plan.

1. Verify site preparation is complete.
2. Identify equipment features and application procedures.

B. Hoistway Compliance 7%

Outcome: Verify hoistways tolerances.

1. Describe procedures for surveying the hoistway.

C. False Cars and Guide Rails 7%

Outcome: Install false cars and guide rails.

1. Describe procedures and safety factors for installing false cars and guide rails.

D. Machine Room Equipment and Wiring..... 15%

Outcome: Install machine room equipment and wiring.

1. Describe positioning and installation of machine room equipment.
2. Describe tools and materials for wiring machine room equipment.
3. Interpret wiring diagrams.

E. Pit Structures 7%

Outcome: Install pit structures.

1. Describe installation procedures for pit structures.
2. Install pit structures.

F. Elevator Mechanical Systems 7%

Outcome: Install elevator mechanical systems.

1. Describe installation procedure for cars and components.
2. Describe positioning and static balancing procedures for car assemblies.

3. Describe dynamic balancing procedures.
4. Describe installation of freight cars.
5. Describe types and characteristics of suspension means.
6. Describe care and handling of suspension means.
7. Describe types of sheaves.

G. Hoistway Entrance Systems 7%

Outcome: ***Install hoistway entrance systems.***

1. Determine elevation of finished floors.
2. Describe types of entrances.
3. Describe installation procedures for door frames, lobby panels and elevator fixtures.
4. Describe components of hoistway doors and lock assemblies.
5. Describe procedures for installing hoistway doors and lock assemblies.

H. Hoistway Wiring Systems 7%

Outcome: ***Install hoistway wiring systems.***

1. Describe installation of duct risers and conduit.
2. Describe conduit layout and fittings.
3. Describe planning procedures and raceway layout.
4. Describe procedures for installing wiring and hoistway switches.
5. Interpret wiring diagrams.
6. Install hoistway wiring systems.

I. Car Cab Systems 7%

Outcome: ***Install car cab systems.***

1. Describe types of traveling cables.
2. Describe cable handling techniques.
3. Describe cable installation procedures.
4. Describe parts of a cab assembly.
5. Describe cab assembly installation.
6. Install car cab systems.

J. Car Door Systems 7%

Outcome: ***Install car door systems.***

1. Describe types and components of car door systems.
2. Describe car door system installation.
3. Describe car door opening devices.
4. Install car door systems.

K. Machine Roomless Elevators 15%

Outcome: Install drive machine and controllers.

1. Describe types and components of machine installation.
2. Describe types and components of controller installation.
3. Describe types of suspension means.
4. Describe hazards associated working on remote machinery.
5. Describe testing procedures on remote machinery.

L. Inspection of Elevating Devices and Commissioning 7%

Outcome: Perform inspection, testing and commissioning of traction elevators.

1. Describe procedure for preparing an elevating device for inspection.
2. Describe procedure to test safety and door lock circuits.
3. Describe procedure for removing temporary jumpers.
4. Describe procedures for setting up communication links.
5. Describe procedure for setting door operation.
6. Describe setting contract, levelling, and inspection speeds.
7. Describe final completion procedure for field tests and data reports.
8. Describe elevating devices branch inspection procedure.
9. Describe local authority inspection list.
10. Describe procedure for brake hold adjustment.
11. Describe electrical schematic wiring diagrams, fuse protection, and safety circuits.
12. Describe procedure for counterweight balancing.
13. Describe Special Emergency Services (S.E.S.).
14. Describe sequence of operation when on emergency power.
15. Describe special hospital service requirements.
16. Describe auxiliary operations.
17. Calibrate elevator safety components.

SECTION FOUR: ..... ELEVATOR HYDRAULIC SYSTEMS 25%

A. Hydraulic Systems…..…… .....……30%

Outcome: Use hydraulic principles.

1. Describe types and applications of hydraulic systems.
2. Describe properties of hydraulic fluids.
3. Describe hydraulic fluid contamination.
4. Describe hydraulic principles.
5. Describe construction, features and applications of hydraulic systems and components.
6. Describe operating principles of hydraulic systems and components.
7. Calculate hydraulic system parameters.

B. Hydraulic Jacking Systems 20%

Outcome: Prepare elevator jacking systems.

1. Describe types of jack units.
2. Install elevator jacking systems.

C. Maintenance of Hydraulics 10%

Outcome: Troubleshoot hydraulic elevator systems.

1. Inspect elevator hydraulic systems.
2. Test elevator hydraulic systems.
3. Troubleshoot elevator hydraulic systems.

D. Hydraulic System Adjustment..... 30%

Outcome: Perform hydraulic valve adjustments.

1. Describe control valve set-up procedures.
2. Adjust valve solenoids.
3. Perform hydraulic valve(s) set-up.

E. Work Platforms 10%

Outcome: Install work platforms.

1. Describe work platforms or false car applications.
2. Describe load capacities of work platforms and false cars.
3. Describe inspection of work platform and false cars.
4. Describe maintenance of work platforms and false cars.
5. Describe code requirements for working from work platforms and false cars.
6. Install work platforms.

SECTION FIVE: .....HYDRAULIC ELEVATOR INSTALLATION..... 20%

A. Hydraulic Elevators 38%

Outcome: Install hydraulic elevators.

1. Describe site planning.
2. Describe installation sequences.
3. Describe above ground, and in ground cylinder plumbing.
4. Describe procedures for surveying hoistway.
5. Describe installation of jack units.
6. Install drive components.
7. Install oil lines.
8. Install pumping units.

B. Hydraulic Distribution System 25%

Outcome: Install hydraulic distribution systems.

1. Describe types of pump units.
2. Describe installation procedures for hydraulic distribution systems.
3. Describe safety issues regarding the hydraulic distribution systems and work area.
4. Install hydraulic distribution systems.

C. Hydraulic Control Systems..... 25%

Outcome: Install hydraulic control systems.

1. Describe working pressure.
2. Describe relief valve tests.
3. Describe control valve adjustment procedures.
4. Describe process of co-ordination with the electrical controls.
5. Adjust and test control valves.

D. Hydraulic Field Inspections, Tests and Data Reports 12%

Outcome: Complete inspections, testing and data reports.

1. Describe field testing for elevator components.
2. Describe inspection check-lists.
3. Complete inspections, testing and data reports.

SECOND PERIOD TECHNICAL TRAINING
ELEVATOR CONSTRUCTOR TRADE
CURRICULUM GUIDE

UPON SUCCESSFUL COMPLETION OF THIS PROGRAM THE APPRENTICE SHOULD BE ABLE TO PERFORM THE FOLLOWING OUTCOMES AND OBJECTIVES.

NOTE: The safety and precautionary methods and procedures are to be reinforced throughout all of the training, when, and as, the subject matter is being practiced or demonstrated.

SECTION ONE:..... MECHANICAL SYSTEMS 15%

A. Mechanical Transmission Components..... 33%

Outcome: Install power transmission components.

1. Describe components of the power transmission system.
2. Describe belt alignment procedures.
3. Install power transmission components.

B. Bearings and Seals 17%

Outcome: Install bearings and seals.

1. Describe types of bearings and seals.
2. Describe causes of bearing breakdown and failure.
3. Describe procedure for removing bearings and seals.
4. Remove and install bearings and seals.
5. Perform lubrication of bearings

C. Precision Instruments 17%

Outcome: Use precision measurement instruments.

1. Describe the types and use of precision measuring tools.
2. Describe maintenance and storage of precision measuring tools.
3. Perform unit conversion.
4. Use precision measuring instruments.

D. Materials and Fastening Technology 17%

Outcome: Use materials and fasteners.

1. Describe properties and applications of metallic and non-metallic materials.
2. Describe mechanical properties of alloys and metals.
3. Categorize grade and thread type of fasteners
4. Select fasteners for specific applications.

E. Lubrication 16%

Outcome: Use lubrication products.

1. Describe types and properties of lubricants.

2. Describe lubrication devices.
3. Describe procedures for storing and disposing of lubricant.

SECTION TWO:…..ESCALATORS, CARTVEYOR AND MOVING WALK MAINTENANCE 20%

A. Escalator Cartveyors and Moving Walk Conveyances 38%

Outcome: Apply operating principles of moving conveyances.

1. Describe applications of escalators, cartveyors and moving walks.
2. Describe operating principles of escalators, cartveyors and moving walks.
3. Describe components and drive mechanisms.
4. Describe service requirements for each major component.
5. Describe power requirements and operational function of drive mechanisms.
6. Describe other code protective devices.

B. Maintenance Inspections 25%

Outcome: Perform inspections during maintenance.

1. Describe method of visual inspections of escalators, cartveyors and moving walks.
2. Describe procedures for inspecting the performance of escalators, cartveyors and moving walks.
3. Describe the importance of inspection control.
4. Describe devices and equipment used for safety.
5. Describe procedures for public safety.

C. Preparation and Installation 25%

Outcome: Install moving conveyances.

1. Describe procedure for setting a truss.
2. Describe procedure for setting tracks and brackets.
3. Describe procedure to set the machine, bull gear and tension carriage.
4. Describe procedure to install and wire the electrical components.
5. Describe procedure to install chains and belts.
6. Describe procedure to install skirting and decking.
7. Describe procedure to install newels and tracks.
8. Describe procedure to install handrails and guide assemblies.
9. Install moving conveyances.

D. Commissioning 12%

Outcome: Commission moving conveyances.

1. Describe procedure to make the specified adjustments for setting and testing all safety switches.
2. Describe procedure to make the specified adjustments for the brake control.
3. Commission a moving conveyance.

SECTION THREE: .....MODERNIZATION AND ALTERATIONS 15%

A. Preparation for Modernization or Alteration 33%

Outcome: Apply codes and regulations for modernization and alterations.

1. Describe code requirements for minor and major alteration.
2. Apply codes and regulations for modernization and alterations.
3. Calculate counterbalance ratios.

B. Performing Modernization and Alterations 67%

Outcome: Perform modernization and alterations.

1. Describe procedures for working in an occupied building.
2. Describe workplace hazards associated with modernization and alterations.
3. Describe interfacing with new equipment.
4. Describe dangers of overbalancing of the counterweight during cab removal.
5. Describe building power requirements and control wiring requirements.
6. Perform modernization and alterations.

SECTION FOUR: ..... ELECTRICITY 50%

A. Electrical Safety 20%

Outcome: Demonstrate electrical safe work practices.

1. Describe lock-out tag-out procedures.
2. Describe hazards of stored electrical energy.
3. Describe use of electrical jumpers.
4. Describe use of electrical meters and instruments.
5. Demonstrate electrical safe work practices.

B. Principles of Electricity and Magnetism 30%

Outcome: Apply principles of electricity.

1. Describe sources of electricity.
2. Describe static electricity.
3. Describe free electrons.
4. Describe characteristics of magnetism.
5. Describe properties of permanent magnetism.
6. Describe characteristics of electromagnetism.
7. Describe action of magnetic fields around a conductor.
8. Describe principles of induced voltage.
9. Describe electrical terms and symbols.
10. Use mathematical formulas to solve electrical related problems.
11. Design electrical circuits.
12. Apply principles of electricity.

C. Direct Current Circuits 20%

Outcome: ***Use direct (dc) circuits.***

1. Describe direct current.
2. Describe dc power sources.
3. Assemble dc circuits.
4. Operate and test dc circuits.

D. Alternating Current Circuits 20%

Outcome: ***Use alternate (ac) circuits.***

1. Describe alternating current.
2. Describe ac power sources.
3. Describe RMS value of voltage and current.
4. Assemble ac circuits.
5. Operate and test ac circuits.

E. Electrical Testing 10%

Outcome: ***Diagnose electrical systems.***

1. Describe electrical measuring devices.
2. Measure voltage, amperage, and resistance.

THIRD PERIOD TECHNICAL TRAINING
ELEVATOR CONSTRUCTOR TRADE
CURRICULUM GUIDE

UPON SUCCESSFUL COMPLETION OF THIS PROGRAM THE APPRENTICE SHOULD BE ABLE TO PERFORM THE FOLLOWING OUTCOMES AND OBJECTIVES.

NOTE: The safety and precautionary methods and procedures are to be reinforced throughout all of the training, when, and as, the subject matter is being practiced or demonstrated.

SECTION ONE:.....ELECTRICAL SYSTEMS..... 20%

A. Electrical Control Systems 25%

Outcome: Install electrical components.

1. Describe switches.
2. Describe relays.
3. Describe solenoids.
4. Describe timers.
5. Describe contactors.
6. Describe rectifiers.
7. Describe main line disconnect switches.
8. Describe circuit protection devices.
9. Assemble electrical components in circuits.
10. Install electrical components.

B. Transformers..... 13%

Outcome: Install electrical transformers.

1. Describe transformer voltage, current, and power ratings.
2. Describe transformer operation.
3. Describe transformer application for electrical isolation and spike control.
4. Assemble transformers in electrical circuits.

C. Distribution and Control Devices 13%

Outcome: Install distribution systems.

1. Describe power distribution systems.
2. Describe single phase systems.
3. Describe three phase systems.
4. Describe three phase star and delta connections.
5. Describe neutral and ground connections.
6. Describe bonding.
7. Describe grounded and ungrounded control systems.
8. Describe motor start, and power circuits.
9. Perform single phase and three phase calculations.

D. Control Systems 25%

Outcome: Install control systems.

1. Describe types of control systems.
2. Describe brake controls and brake cooling through resistance.
3. Assemble control systems.

E. Electrical Diagrams 12%

Outcome: Assemble electrical circuits from schematic diagrams.

1. Interpret electrical symbols.
2. Interpret electrical schematic diagrams.
3. Locate power and control functions in schematic diagrams.
4. Draw schematic diagrams.
5. Assemble electrical circuit from a schematic diagram.

F. Electrical Conductors 12%

Outcome: Install circuit conductors.

1. Identify electrical conductors.
2. Describe the American Wire Gauge system (AWG).
3. Describe current carrying capacity, thermal ratings, and designations of conductors.
4. Describe requirements of hoistway machine room and raceway wiring.
5. Perform current carrying capacity calculations.
6. Assemble electrical raceway wiring.

SECTION TWO ..... GENERATORS AND MOTOR CONTROL SYSTEMS..... 30%

A. Generators…… ..... ……17%

Outcome: Service generators for elevating devices.

1. Describe electromagnetism pertaining to motor generator action.
2. Describe induction.
3. Describe factors that determine induced EMF strength.
4. Describe effects of motion on direction of current.
5. Describe components of a generator.
6. Describe generating operation.
7. Operate and test electrical motor generator circuits.

B. Electric Motors..... 25%

Outcome: Install electric motors.

1. Describe characteristics of electric motors:
2. Describe types of motors.
3. Describe speed and torque in a compound motor.

4. Operate and test electrical motor circuits.

C. DC Motor Control Systems 25%

Outcome: Install dc motor control systems.

1. Describe the Ward-Leonard System.
2. Describe control system types.
3. Describe speed control.
4. Describe SCR/Transistor drives
5. Describe speed sensing devices.
6. Describe electronic drive safety features.
7. Assemble dc motor control systems.
8. Operate and test dc motor systems.

D. AC Motor Control Systems 33%

Outcome: Install ac motor control systems.

1. Describe motor action (ac).
2. Describe the rotating field.
3. Describe armature rotation.
4. Describe motor performance characteristics.
5. Assemble ac motor circuits.
6. Operate and test ac motor circuits.

SECTION THREE: ..... ELECTRONICS..... 20%

A. Solid State Electronic Components……. ..... ……13%

Outcome: Install electronic components.

1. Describe functions of diodes, transistors and thyristors.
2. Describe solid state devices and their applications.
3. Describe conduction in intrinsic, doped germanium and silicon.
4. Describe care and handling of solid state devices.
5. Install electronic components.

B. Diodes 13%

Outcome: Diagnose electrical components.

1. Describe function of diodes.
2. Describe diode forward and reverse biasing.
3. Describe characteristics of germanium and silicon diodes.
4. Describe diode applications.
5. Describe rectifiers.
6. Describe zener diodes and their applications.
7. Describe voltage regulation with zener diodes.

8. Describe varistors.
9. Describe light emitting diodes (LED).
10. Describe photodiodes.
11. Assemble and test diodes in electrical circuits.

C. Transistors 12%

Outcome: ***Test transistors.***

1. Describe application of transistors.
2. Describe characteristics of transistors.
3. Describe configuration of transistors.
4. Describe transistor circuit arrangements.
5. Perform transistor testing.

D. Thyristors 12%

Outcome: ***Test thyristors.***

1. Describe types of thyristors.
2. Describe function of thyristors.
3. Describe configurations of thyristors.
4. Perform thyristor testing.

E. Digital and Analog Integrated Circuits 12%

Outcome: ***Test integrated circuits.***

1. Describe function of digital and analog integrated circuits.
2. Describe development of digital integrated circuits.
3. Describe digital integrated circuit packaging.
4. Perform digital integrated circuit testing.

F. Solid State Power 13%

Outcome: ***Test solid state devices.***

1. Describe function of power supply systems.
2. Describe features of power supply devices.
3. Describe application of power supply systems.
4. Describe testing equipment and procedures.
5. Describe construction features of operational amplifiers.
6. Describe function and application of operational amplifiers.
7. Describe power supplies for operational amplifiers.
8. Define the term “gain” as applied to operational amplifiers.
9. Perform operational amplifier calculations.

G. Solid State Electronics 13%

Outcome: Install solid state electronic devices.

1. Describe the number systems used in solid state devices.
2. Define memory terms.
3. Describe the function of microprocessors.
4. Describe microprocessor terms.
5. Describe testing procedures for integrated circuits.
6. Describe troubleshooting procedures for microprocessors.
7. Install solid state electronic devices.

H. Programmable Logic Control Systems 12%

Outcome: Install programmable logic control systems.

1. Describe Programmable Logic Control System (PLC).
2. Describe features of a programmable logic control system.
3. Describe applications for programmable logic control.
4. Perform programming of a PLC.
5. Install programmable logic control system.

SECTION FOUR: ..... ……CIRCUIT TRACING AND TESTING..... 30%

A. Circuit Tracing 67%

Outcome: Perform circuit testing on elevating devices.

1. Identify main system components and symbols.
2. Describe circuit tracing of elevator operating systems.
3. Describe circuit tracing of safety systems.
4. Describe circuit tracing of emergency service.
5. Describe logic control systems.
6. Interpret schematic wiring diagrams for elevating device.
7. Perform circuit testing on elevating devices.

B. Diagnostic Test Equipment 16%

Outcome: Use diagnostic test equipment.

1. Describe types of diagnostic testing equipment.
2. Perform inspection and testing procedures for test equipment.
3. Test circuits using diagnostic testing equipment.

C. Troubleshooting Procedures 17%

Outcome: Troubleshoot electrical circuits.

1. Describe troubleshooting processes.
2. Describe troubleshooting the Ward-Leonard system.

3. Perform troubleshooting on safety controls.
4. Perform troubleshooting procedures on relay, PLC and microprocessor based control circuits.
5. Perform troubleshooting procedures on single automatic push button systems.
6. Perform troubleshooting on collective relay systems.

FOURTH PERIOD TECHNICAL TRAINING
ELEVATOR CONSTRUCTOR TRADE
CURRICULUM GUIDE

UPON SUCCESSFUL COMPLETION OF THIS PROGRAM THE APPRENTICE SHOULD BE ABLE TO PERFORM THE FOLLOWING OUTCOMES AND OBJECTIVES.

NOTE: The safety and precautionary methods and procedures are to be reinforced throughout all of the training, when, and as, the subject matter is being practiced or demonstrated.

SECTION ONE:.....SPECIAL APPLICATION LIFTING DEVICES AND GOVERNANCE 20%

A. Inclined Travel Elevators 12%

Outcome: Install inclined travel and sidewalk elevators.

1. Describe types and components of inclined travel elevators.
2. Describe construction and operation of inclined travel elevators.
3. Apply codes for inclined travel elevators.
4. Describe types and components of sidewalk elevators.
5. Describe construction and operation of sidewalk elevators.
6. Apply codes for sidewalk elevators.

B. Lifts for Persons with Physical Disabilities (LPPD) 33%

Outcome: Install lifts for persons with physical disabilities (LPPD's).

1. Describe types and components of LPPD's.
2. Describe construction and operation of LPPD's.
3. Describe application and components of stair chair lifts.
4. Describe application and components of vertical platform lifts.
5. Describe main components and drive mechanisms.
6. Describe lift control methods for lift devices.
7. Describe lift operating procedures.
8. Describe types of drives and components.
9. Describe installation methods and procedures.
10. Describe test procedures.
11. Perform visual inspections.
12. Apply codes for LPPD's.
13. Install and maintain LPPD's.

C. Silent Butlers..... 13%

Outcome: Install silent butlers.

1. Describe types and components of silent butlers.
2. Describe construction and operation of silent butlers.
3. Apply codes for silent butlers.
4. Install silent butlers.

D. Material Lifts..... 12%

Outcome: Install material lifts.

1. Describe types and components of material lifts.
2. Describe construction and operation of material lifts.
3. Apply codes for material lifts
4. Install material lifts.

E. Manlifts 12%

Outcome: Install manlifts.

1. Describe types and components of manlifts.
2. Describe construction and operation of manlifts.
3. Apply codes for manlifts.
4. Install manlifts.

F. Construction Hoists 13%

Outcome: Install construction hoists.

1. Describe types and components of construction hoists.
2. Describe construction and operation of construction hoists.
3. Apply codes for construction hoists.
4. Install construction hoists.

G. Workplace Coaching Skills..... 5%

Outcome: Use coaching skills when training an apprentice.

1. Describe the process for coaching an apprentice.

SECTION TWO:..... PREVENTIVE MAINTENANCE 20%

A. Public Safety……..... ……13%

Outcome: Perform public safety procedures.

1. Describe public impact during maintenance.
2. Describe circumstance and location of maintenance signage.
3. Describe procedures and equipment for barricading entrances for maintenance.

B. Site Visits..... 25%

Outcome: Perform preventative maintenance.

1. Describe customer communication.
2. Identify abnormal operating conditions.
3. Inspect safety circuits and devices.
4. Inspect mechanical and electrical operating components.
5. Inspect the condition of the components.
6. Inspect operation and condition of the fixtures.

7. Inspect appearance and cosmetic details
8. Observe operation of components and system.
9. Perform preventative maintenance checks.

C. Lock-Out Tag-Out and Reinstatement Procedures 25%

Outcome: Perform lock-out tag-out procedures.

1. Describe how to use the controller maintenance operation.
2. Describe the method of ensuring the device is unoccupied.
3. Describe the method of ensuring the electrical device is isolated.
4. Describe the method of ensuring the device is mechanically secured.
5. Describe procedures to ensure the electrical protective devices are operating.
6. Describe procedure to test and verify the correct operation prior to returning to service.
7. Apply lock-out and tag-out procedures.

D. Remote Monitoring 25%

Outcome: Install remote monitoring systems.

1. Describe operation of remote monitoring systems.
2. Describe hazards of remote monitoring systems.
3. Interpret information provided by remote monitoring systems.

E. Log Books 12%

Outcome: Use log books.

1. Describe the purpose of log books.
2. Describe the information recorded in a log book.
3. Describe the maintenance control program.
4. Describe applicable codes used for log book applications.
5. Complete log book requirements.

SECTION THREE: .....ELEVATOR MAINTENANCE ROOM EQUIPMENT 25%

A. Machine Room Safety 10%

Outcome: Perform live equipment assessment.

1. Describe machine room equipment.
2. Describe machine room hazards.
3. Perform machine room assessment.

B. Motors and Generators 10%

Outcome: Service motors and generators.

1. Describe maintenance of motors and generators.
2. Service motors and generators.

C. Drive Machines 10%

Outcome: ***Service drive machines.***

1. Describe geared, gearless, and drum machine types.
2. Describe drive machine maintenance.
3. Determine the condition of machine parts.
4. Determine sources of oil loss.
5. Service drive machines.

D. Sheaves and Drums 10%

Outcome: ***Service sheaves and drums.***

1. Describe types of roping arrangements.
2. Describe traction sheave groove types.
3. Describe inspection of sheaves and drums.
4. Determine the condition of sheave grooves.
5. Determine the use of sheave liners.
6. Determine the integrity of torque transmitting elements to drive sheaves.
7. Determine the reliability of wire rope fastenings on drums.
8. Service sheaves and drums.

E. Machine Brakes 10%

Outcome: ***Service machine brakes.***

1. Describe types of brake systems.
2. Describe types and applications of brake release systems.
3. Describe brake system cleaning and lubrication procedures.
4. Describe brake relining and alignment procedures.
5. Service machine brake.

F. Elevator Safety Devices 10%

Outcome: ***Service machine safety devices.***

1. Describe types of governors and their applications.
2. Describe operating and testing procedures for governors and related components.
3. Describe cleaning and lubrication procedures for governors.
4. Describe types of elevator safeties and their applications.
5. Describe types of emergency braking devices and their applications.
6. Describe maintenance and operation of emergency braking devices.
7. Determine causes of uncontrolled motion.
8. Perform governor maintenance and testing.
9. Perform emergency braking device maintenance and testing.

G. Control Equipment 10%

Outcome: Service control equipment.

1. Describe operating conditions of control equipment.
2. Describe the method of cleaning control equipment.
3. Describe maintenance requirements for control equipment.
4. Service control equipment.

H. Suspension Means..... .....20%

Outcome: Service suspension means.

1. Describe types of suspension means.
2. Describe cleaning and lubricating requirements for suspension means.
3. Describe inspection procedure for suspension means.
4. Describe method for checking and adjusting tension for suspension means.
5. Describe methods to prevent suspension means corrosion.
6. Describe methods of suspension means terminations.
7. Service suspension means.

I. Hydraulic System Devices 10%

Outcome: Service hydraulic systems.

1. Describe hydraulic system testing.
2. Perform a visual inspection for fluid leaks.
3. Perform pressure tests.
4. Perform oil loss test procedures.
5. Service hydraulic systems.

SECTION FOUR: ..... ELEVATOR CAR EQUIPMENT MAINTENANCE 15%

A. Car Doors and Gates 17%

Outcome: Service elevator car doors and gates.

1. Describe inspection checks for door operation and re-opening devices.
2. Describe inspection checks for gib wear, upthrust adjustments and retainers.
3. Describe inspection checks for skates, vanes, and clutches.
4. Describe inspection checks for gates switches and operating rollers.
5. Describe inspection checks for linkage arms and assemblies.
6. Describe inspection checks for re-opening device cabling.
7. Describe inspection tests for door restrictors.
8. Describe inspection tests for relating system devices.
9. Service elevator car door and gates.

B. Elevator Enclosures 17%

Outcome: Service elevator enclosures.

1. Describe inspection checks for elevator enclosures.
2. Describe inspection checks for call buttons and alarm buttons.
3. Describe inspection checks for key switches.
4. Describe inspection checks for fixtures and bulbs.
5. Describe inspection checks for communication system and audible devices.
6. Describe inspection checks for emergency lighting.
7. Perform elevator enclosure inspections.

C. Car Tops 17%

Outcome: Service car top equipment.

1. Describe car top hazards.
2. Describe car top cleaning.
3. Describe inspection checks for load weighing devices.
4. Describe inspection checks for guides, guide shoes, slippers and rollers.
5. Describe method to clean, adjust, and lubricate guides.
6. Describe maintenance for the retiring cams and motors.
7. Describe maintenance for suspension means shackles, hitches, and springs.
8. Describe maintenance for door operators, cam assemblies and resistors.
9. Describe maintenance for car top sheaves, guards, and shafts.
10. Describe maintenance for electrical switches and switch assemblies.
11. Describe maintenance for the governor rope hitch, release carriers, levers, arms and return springs.
12. Service car top equipment.

D. Car Bottoms 16%

Outcome: Service car bottom equipment.

1. Describe inspection checks for load weighing devices.
2. Describe inspection checks for guide shoes, slippers and rollers.
3. Describe inspection checks for isolation devices and travelling cable attachments.
4. Describe inspection checks for compensating chains or ropes and their attachments.
5. Describe inspection checks for buffer and striker plates.
6. Describe inspection checks for platen and plunger attachments.
7. Service car bottom equipment.

E. Car Safety Components 33%

Outcome: Service elevator car safety components.

1. Describe types, operation, and applications of safety components.

2. Describe methods of disassembling, cleaning, lubricating, reassembling, and adjusting safety components.
3. Describe tests needed to ensure a safeties are operating correctly.
4. Service elevator car safety equipment.

SECTION FIVE: .....HOISTWAY AND PIT EQUIPMENT MAINTENANCE 20%

A. Hoistway Door Equipment 25%

Outcome: Service hoistway door equipment.

1. Describe hoistway door equipment components
2. Describe door component cleaning, and lubricating procedures.
3. Describe inspection checks for gib wear, upthrust adjustments and retainers.
4. Describe inspection checks for door unlocking assemblies.
5. Describe inspection checks for door unlocking mechanical and electrical components.
6. Describe inspection checks for door closing assemblies.
7. Describe inspection tests for door restrictors.
8. Describe inspection tests for relating system devices.
9. Describe hoistway door adjustment procedures.
10. Perform hoistway door maintenance.

B. Counter Weight Assembly 12%

Outcome: Service hoistway counter weight assembly.

1. Describe types of counter weight assemblies.
2. Describe inspections and checks for the counter weight assemblies.
3. Describe inspection checks for guides, guide shoes, slippers and rollers.
4. Describe methods to clean, adjust and lubricate guides.
5. Describe inspection checks for sheaves, guards and shafts.
6. Describe inspection checks for suspension means, shackles, hitches and springs.
7. Describe counter weight maintenance.
8. Service hoistway counter weight systems.

C. Leveling Components 13%

Outcome: Service leveling components.

1. Describe leveling component systems.
2. Describe operation of leveling components.
3. Describe inspection checks for leveling components.
4. Describe clearance required for leveling components.
5. Maintain and inspect leveling components.

D. Counter Balance 12%

Outcome: Adjust counter balance.

1. Describe maintenance procedures for hoistway counter balance ratio after cab renovations.
2. Describe maintenance procedures for hoistway counter balance ratio after replacement of traveling cables.
3. Adjust counter balances.

E. Governor Rope..... 13%

Outcome: Service governor rope.

1. Describe inspection checks for governor ropes.
2. Describe maintenance procedure for governor rope.
3. Describe inspection checks for governor idler sheave.
4. Maintain and inspect governor ropes.

F. Traveling Cable 12%

Outcome: Service traveling cable.

1. Describe inspection checks for travelling cable.
2. Describe inspection checks for travelling cable hitches.
3. Describe inspection checks for travelling cable protection devices.
4. Service traveling cables.

G. Pit Equipment……..……..…… ..... ……13%

Outcome: Service pit equipment.

1. Describe pit hazards.
2. Describe pit cleaning.
3. Describe inspection and checks for pit components.
4. Describe cleaning, lubricating and adjusting procedures.
5. Describe inspection and checks for car and counter weight run-by.
6. Describe inspection and checks for car and counter weight buffers.
7. Describe inspection and checks for compensation systems.
8. Describe inspection and checks for hydraulic system equipment.
9. Perform inspection checks for hydraulic system equipment.

Apprenticeship and Industry Training

Alberta Trades. World Ready.

097